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THE LARVA OF A CHIRONOMID (DIPTERA).....*P. W. Claassen.*

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VOL. XIV.] OCTOBER, 1922. [No. 16.

The Larva of a Chironomid (*Trissocladius equitans* n. sp.) Which Is Parasitic upon a May-fly Nymph (*Rithrogena* sp.).*

BY P. W. CLAASSEN.

IN AUGUST, 1919, while spending a few weeks in Colorado, the writer was collecting aquatic insects in the Big Thompson river in Estes Park. This river is a typical mountain stream. The water is very cold and rushes along in a swift current over a stony bed. Aquatic insects of the swift-water type were very abundant. Among the May-fly nymphs collected there were found about a dozen specimens of one species which presented a curious appearance. Upon examining some of these nymphs it was found that each one carried upon its back a large, white dipterous larva. These larvæ had attached themselves to the thorax of the nymphs underneath the wing pads. The large size of the larva forced the wing pads of the May-fly nymph upward at a very decided angle and gave the nymph a humped-up appearance as it rested upon the stone.

All the collected material was preserved in alcohol and taken back to Ithaca, N. Y., for study. When the material was examined more closely in the laboratory, some of these May-fly nymphs were found to carry larvæ, while others of the same species carried pupæ of the dipterous insect.

The May-fly nymph proved to be a species of the genus *Rithrogena*. Although it was impossible to determine definitely the genus of the dipteron, Dr. O. A. Johannsen, who examined it, felt certain that it belonged to the family Chironomidæ. The scarcity of material and the lack of adult forms, however, made it impossible to sat-

* Read before the joint session of the Entomological Society of America and Ecological Society of America, January, 1922. Withdrawn for publication in this bulletin.

isfactorily establish the relationship which existed between these two forms.

During the summer of 1921 the writer made another trip to Estes Park, Colo., and again found these May-fly nymphs in the same situation in the Big Thompson river where they had previously occurred. A careful search was then made over a distance of a mile or more in this stream, but there was only this one particular spot in which the *Rithrogena* nymphs could be found in considerable numbers. This was in a part of the stream where the current was quite swift and the water not over six to ten inches deep. The bed of the stream was covered with stones, many of the stones projecting above the surface of the water. May-fly nymphs, stone-fly nymphs, caddis worms and other swift-water forms were very plentiful. As many as five or six specimens of the *Rithrogena* nymphs occurred on a single stone. Upon taking a stone out of the water and turning it over, these nymphs would quickly glide to the under side of the stone, appearing to be much more elusive than any of the other species of the May-fly nymphs present. A total of nearly 300 of the *Rithrogena* nymphs were collected, and more than ninety per cent of them were found to carry either a larva or a pupa of the chironomid.

An attempt was then made to rear to the adult stage the May-fly and the chironomid. In order to accomplish this a number of the nymphs which carried pupæ were placed in small wire cylinder cages. Some of the cages were placed in the part of the stream where the nymphs naturally occurred, while others were placed in a spring near the writer's cottage, where they could be kept under close observation. Three males of the chironomids emerged on August 7, two of them from cages in the stream and one from a cage in the spring. A female also emerged on the same date, but it escaped. On August 8 two males of the May-fly emerged, one from a cage in the stream and the other from a cage in the spring. On the previous day two females of the May-fly were caught in a net near the same spot where all the material was collected, and these later proved to belong to this same species.

The necessity of leaving the park on August 8 prevented any further rearing work, and the material from the cages was added to the alcoholic specimens and taken back to the laboratory at Cornell University.

The May-fly has been determined by Dr. J. G. Needham, who recognizes it as a new species of the genus *Rithrogena*. A descrip-

tion of this species will be given by Doctor Needham in a paper which is soon to be published.

The chironomid is a new species of *Trissocladius*, a genus new to this country.*

DESCRIPTION OF THE STAGES OF THE CHIRONOMID.

Trissocladius equitans n. sp.

ADULT.

Length, 4.5 mm., exclusive of antennæ. General color, blackish brown.

Head blackish; eyes black, naked, slightly emarginate on inner margins, the facets moderately rounded; distance between the eyes from above greater than the length of the eye. Labium short, thick, and reaching to the second segment of the palpi. Palpi short, three-segmented; the first segment nearly twice as long as broad; second segment twice as long as broad; third segment gradually tapering to the tip and a little longer than second segment; total length of palpi about .25 mm. Antennæ composed of fourteen segments, the terminal one-half again as long as the combined length of segments two to twelve; basal segment large; second segment about twice as long as third; total length of antenna 1.3 mm.; entire antennæ covered with long hairs, the basal hairs as long as the terminal segment. Epistome without bristles; transverse suture distinct.

Thorax blackish brown, with whitish pruinose patches; dorsum with a narrow median line, depressed in front and raised into a feeble carina behind the middle; surface smooth except for a few hairs on each side of the broad, flattened longitudinal area of the mesonotum; collar incised in middle, angles rounded; scutellum and metanotum blackish, smooth; plura and pectus blackish, smooth.

Abdomen compressed, blackish, with long, yellowish hairs; basal segment of the male clasper about twice as long as the distal segment, spoon-shaped, the median projection or tubercle blunt, with short hairs, basal segment below with long hairs; distal segment narrow at base and gradually enlarging toward the apex, a few hairs above and underneath with two short spines near the tip.

Wings milky white, reaching to the base of the claspers; surface finely punctate; anal lobe produced and fringed with long hairs; venation as in figure 14.

Halteres pale, slightly infuscated.

Legs light brown, hairy; tibia of front leg 1.4 times the length of metatarsus; a single distinct spur at distal end of tibiæ, the ones on the posterior legs being much larger; fourth and fifth tarsal segments of equal length; tarsal claws squarely truncate, surface fluted; no pectinate empodium present.

Type in the Cornell University collection, now mounted in balsam. Paratypes, two males; one a pinned specimen, the other in alcohol, in the Cornell University collection.

These specimens are all from Estes Park, Colo., August 7, 1921.

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*Acknowledgments are due to Dr. O. A. Johannsen, who recognized this as a new species, and without whose assistance the following descriptions could not have been adequately made.

LARVA.

Length, 6-7 mm. when fully grown. Color white.

Head very small, not over .25 mm. in diameter. Prothoracic proleg double, short, with many short spines; caudal prolegs short, each with a ring of about 24 short spines. Anal gills not apparent.

Head yellowish brown, with a narrow black hind border; on the ventral surface of the head, near the hind border, there is on each side a light oval spot, suggestive of an ocellus. Mouth parts very small and difficult to dissect out; they are much reduced in size; the mandibles are composed of a single sharp tooth with two short spines on the inner margin near the base of the tooth; labrum small, the front margin excavated in the middle so as to leave a bluntly rounded chitinized tooth on each side; labial palpi very short; antennæ minute, easily overlooked.

PUPA.

Length, 5-5.3 mm. Color brown; a narrow, blackish margin around the wings, and a narrow longitudinal dark line each side of the abdomen. The entire pupa is smooth and devoid of any vestiture. Breathing trumpets not well developed, but represented by a spiracularlike chitinized area each side of the mesothorax. These breathing trumpets are best seen in the late larval stage when the pupa is being formed (fig. 7). Segment one to three of the abdomen smooth; segments four and five, above, each with a double transverse band of fine spines on the posterior margin, the spines of the hindmost bands directed forward and at least twice as long as the spines on the band immediately in front; segments six, seven and eight each with a single transverse band of short spines. Genital sacs smooth, no hairs or spines present. On the lateral margin of the abdominal segments the vestigial spiracles are visible.

THE BIOLOGICAL RELATIONSHIP

Between *Trissocladius equitans and Rithrogena* sp.

With plentiful material on hand it has been possible to establish the relationship which exists between the immature stages of these insects. The larva of *Trissocladius equitans* is parasitic upon the *Rithrogena* May-fly nymph. Although it has not been possible to learn in what manner the larva establishes itself as a parasite on the nymph, indications are that *Trissocladius equitans* spends its entire larval life as a parasite upon the May-fly nymph. Different-sized larvæ, representing the instars, except possibly the first, were found under the wing pads of the nymphs.

The parasite attaches itself to the posterior margin of the mesothorax underneath the wing pads, where it imbeds its head in the softer tissue of the nymph and where it draws its nourishment from the host. The larva spins a sheet of silk, which completely invests its body, and by means of which it attaches itself firmly to the body of the nymph. At first, stretched to its full length, the larva

lies across the body of the nymph, but as it grows larger the posterior end of the body doubles under, and later, when the larva becomes full grown, the middle part of its body projects backward over the abdomen of the nymph in the form of a letter U. When ready to pupate the larva releases its hold at the head end and turns back over the abdomen of the nymph. The pupa thus extends over about half the abdomen of the host. The transparent sheet of silk invests the pupa as well as the larva. Just before the adult is ready to emerge the pupa breaks through this investing membrane and rises to the surface of the water, where the adult emerges in a manner similar to that in other chironomids.

That the larva is a parasite upon the nymph is apparent from the following facts: First, the silk membrane completely surrounds the larva. There is no opening in this membrane which would make it possible to obtain food from the outside. Second, an examination of the stomach contents of a number of larvæ failed to reveal the presence of any vegetable material, but did contain animal matter, especially fat bodies. This fact was also borne out in a study of cross sections of the larvæ. Third, a study of the head and mouth parts of the parasite reveal their reduced condition. The head is very small in proportion to the size of the body and the mouth parts are much reduced.

The European species of the genus *Trissocladius,* of which the larvæ are known, are all found as free living forms feeding upon vegetable matter.*

The reduced size of the head and mouthparts of *Trissocladius equitans* indicate that this parasitic relationship has existed for a long time. Whether the parasite ever becomes so injurious as to kill its host the writer has not been able to determine. Another question of interest is what happens to the parasite when the nymph casts its skin. The life cycle of the parasite is either so short that development is completed during a nymphal instar of the host, or else the parasite must be able to detach itself from the cast skin and reëstablish itself upon the newly emerged nymph or upon another individual, otherwise it must perish.

There appears to be no relationship between the relative ages of the host and parasite. Pupæ of the parasite were found upon medium-sized nymphs, while, on the other hand, young larvæ occurred upon nymphs that were evidently in the last nymphal instar.

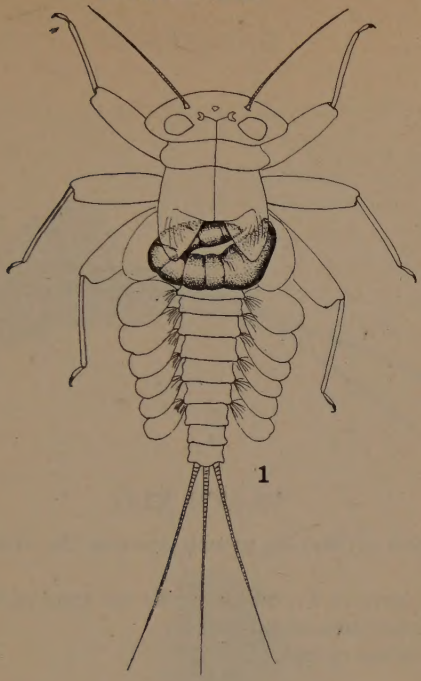
*Barnard, K. H., in the Entomologist's Monthly Magazine, vol. 47:76-78, 1911, reports the case of a chironomid larva (name not given) which is parasitic upon a fresh water snail, *Limnæa peregra.*

PLATE XLI.

FIG. 1. *Rithrogena* nymph with a larva of *Trissocladius equitans* under the wing pads.

FIG. 2. Nymph with a pupa.

PLATE XLI.



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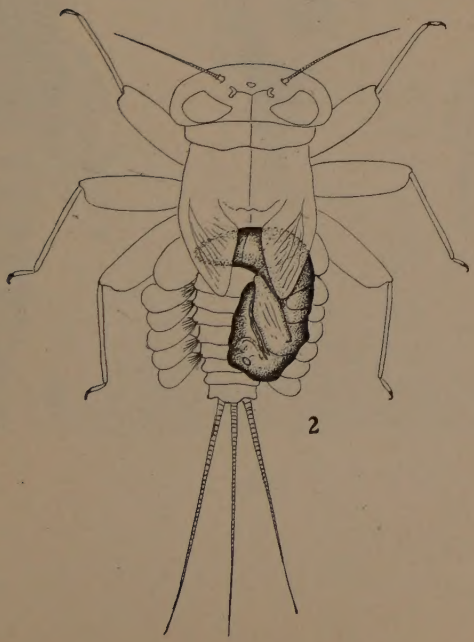

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PLATE XLII.

FIG. 3. Side view of May-fly nymph, showing the chironomid pupa under the wing pads.

FIG. 4. Young larva of *T. equitans* under the wing pads of the nymph.

FIG. 5. Full-grown larva on the nymph.

FIG. 6. Pupa on the nymph.

PLATE XLII.

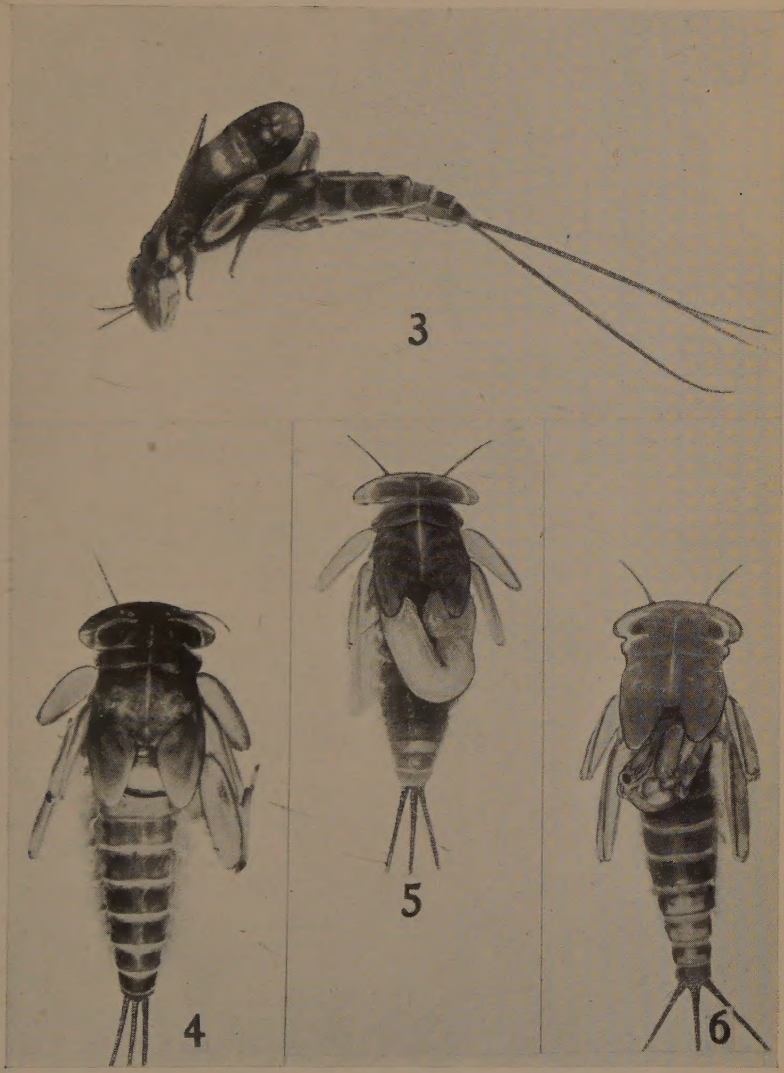

PLATE XLIII.

FIG. 7. Full-grown larva of *T. equitans*. In the thorax may be seen the breathing trumpets of the developing pupa within.

FIG. 8. Mandible of the larva of *T. equitans*.

FIG. 9. Labium of the larva.

FIG. 10. Hind proleg of the larva.

FIG. 11. Portion of the abdomen of the pupa.

FIG. 12. Adult, *T. equitans*.

FIG. 13. Clasper of male.

FIG. 14. Wing of male.

FIG. 15. Young larva.

FIG. 16. Nearly full-grown larva. The black line indicates the edge of the silk membrane which envelopes the larva and by means of which it is attached to its host.
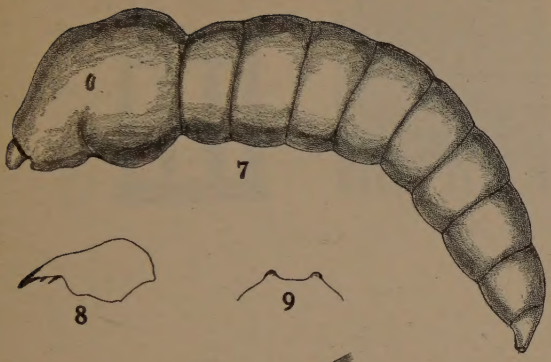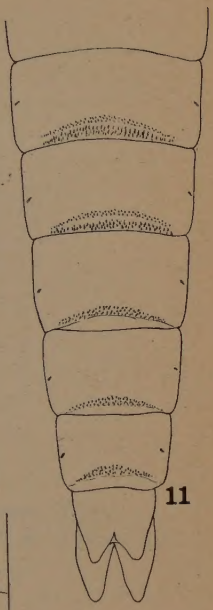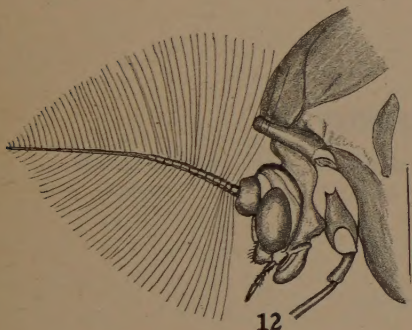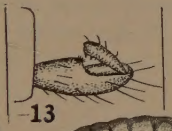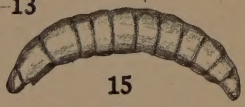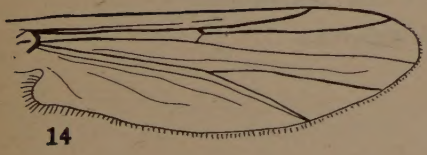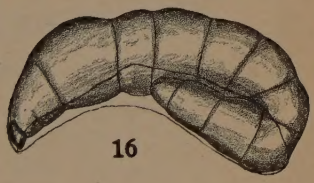
PLATE XLIII.